Fig. 3-1 Front panel

c) 6 functional buttons keypad for manual (local) control of the amplifier. The function of each button is indicated on the display above it. Depending on the displayed menu, the buttons may have different functions.

d) A color display showing the operating information.

3-3. Initial switching on

In order start up the amplifier, push and hold the POWER button on the front panel for one or two seconds - about ten seconds later (boot sequence) the display will flash and show the **basic screen** with the amplifier information - Fig. 3-2.

The amplifier may start either in Stand-by or in Operate mode – see S. 5-4 USER PREFERENCES - AUTO OPERATE.

3-4. Basic screen

There are 9 information areas on the basic screen:

a) Information area for the frequency band – the edges of the currently selected BAND are displayed.

If the amplifier doesn't receive any operating frequency data from CAT or via RS232, it will switch to the last used band at startup.

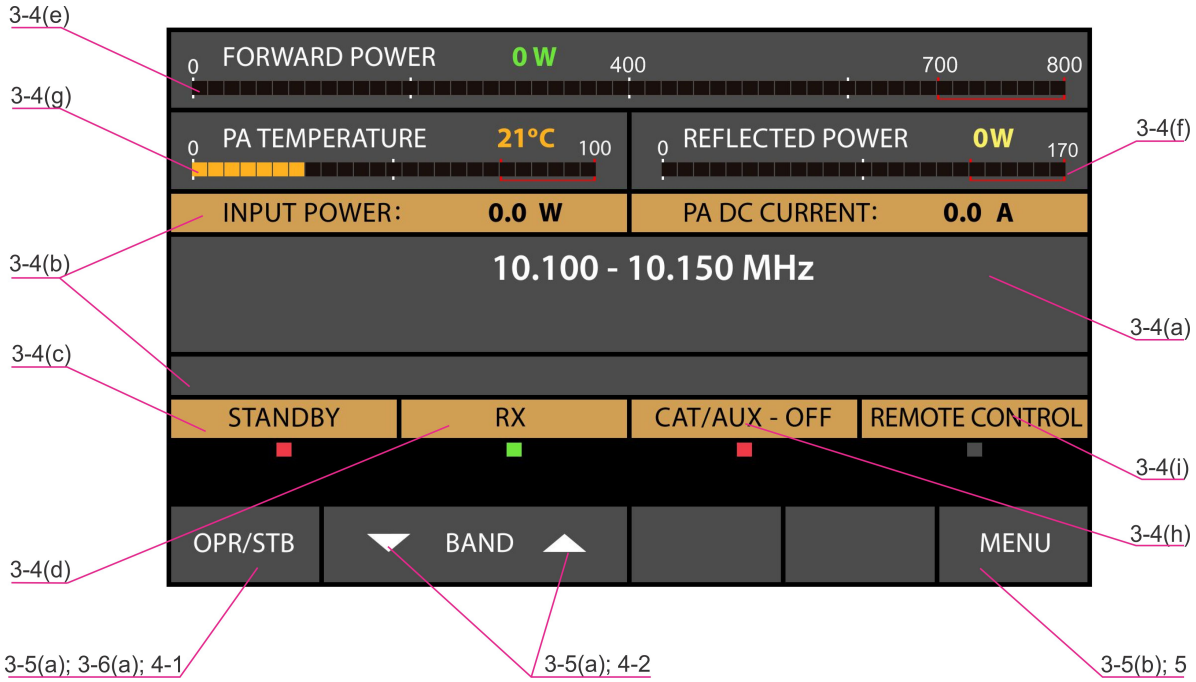

Fig. 3-2 Basic screen

b) Operating values and alarm messages area.

Any two operating values selected in the AMP MEASURE menu (S. 5-1) will be shown here.

The alarm messages (either WARNING or SOFT FAULT) appear on yellow background on the same area and are flashing frequently in order to attract the operator's attention (Fig. 4-1).

The WARNING messages appear only temporarily (for about three seconds), afterwards the indication of the operating values is restored automatically (S. 4-4(a).

The SOFT FAULT messages appear in the same field but they remain on the screen until the AUTO OPERATE time is elapsed (S.4-1(c)) or until the operator pushes any button, then the operating values indication is restored too.

c) Working mode indicator - OPR, STB or AUTO OPER (S. 4-1).

d) RX/TX indicator - reads the request for transmit (KEY-IN input). The RX indication is green and the TX is red. The indicator will flash frequently if switch over is impossible.

e) Forward power bargraph and digital readout. Displays the power fed into the antenna.

f) Reflected power bargraph and readout. Entering the red zone is not allowed.

g) PA transistor temperature bargraph and readout. Entering the red zone is not allowed.

h) CAT interface information. When CAT is deactivated, this field is shaded.

i) REMOTE CONTROL information field–flashing represents RS232 port dataflow.

3-5. Control system – buttons and menus

a) The OPR/STB and the BAND buttons are used for manual (local) control of the (Fig. 3-2):

- the left-most button OPR/STB switches over the amplifier between Operate and Stand-by modes;

- the next two buttons – BAND up and down arrows - change the frequency bands in ascending or descending order;

b) The right-most button MENU (Fig. 3-2) provides access to the amplifier's settings and service functions;

- in each menu the left-most button is always HELP and the right-most – always EXIT;

- the HELP button provides information about the current screen;

For more details of the control system and use of the menus see Section 5. MENUS – USEFUL TOOLS AND OPTIONS.

3-6. Test transmission

To make sure that you have installed the amplifier correctly, make a test transmission as described below. Repeat these tests for each new band and antenna, as well as after installing a new or repaired antenna, antenna switch, tuner, and / or the connecting cables.

a) Check of RF by-pass path of a non-driven amplifier.

For this check the amplifier must be completely installed and connected according to Section 2, but not powered by the mains, i.e. the POWER ON switch on the rear panel must be turned off. In any case the LED above the POWER button must be dark for this test.

First, check if the transceiver's reception is normal. If you observe a significant worsening of reception, first check for a problem in the coaxial connections to the amplifier (S. 2-3(d),(e)).

If reception is normal, prepare the transceiver as follows:

- select a continuous carrier mode (CW, RTTY, FM);

- switch the microphone off (decrease the mic gain), disable FSK;

- reduce the output power control to a minimum;

- select a suitable indication so that you can watch the RF power and SWR at the transceiver output;

- if the transceiver has a built-in antenna tuner – switch it off.

Now in receive mode select a frequency which is not occupied at the moment and press shortly the PTT or TX key while watching the output power and the SWR readings. If the power or SWR at the transceiver output are too high (over 5W or SWR over 2:1) release the key and check for the reason as follows:

- check again whether the power control is set at minimum;

- check whether the frequency is within the operating range of the selected antenna;

- check the good working order of the coaxial cables, connectors, and feed lines from the transceiver antenna jack through the amplifier, the antenna switch or external tuner (if there is one) to the BALUN transformer, and the antenna itself (S. 2-3(e)).

If the power and SWR are as expected, transmit again and while watching the power and the SWR readings, increase transceiver power gradually from minimum to maximum (but not more than 170W in order to not overload the RF by-pass circuit of the amplifier).

If SWR remains below 2:1 (preferably below 1.5:1) at the last test, decrease the power from the transceiver to minimum again and continue with the next check-up.

b) Check-up in Stand-by mode.

Turn the amplifier on, as described in Sections 3-1 to 3-4 (Fig. 3-2).

Make sure that the amplifier is in Stand-by mode. Push the OPR/STB button if needed.

Repeat receive and transmit tests as it was done with the amplifier turned off. During these tests note also whether the forward and reflected power bargraph and digital readout (S. 3.4(e),(f)) show respective RF power presence. If the reflected power exceeds the forward power, verify that the input and output coaxial cables to the amplifier are not interchanged (S. 2-3(d),(e)).

N O T E

The power indication accuracy is optimized around the 700W level and usually it is unreliable below 40W.

c) Entering Operate mode.

At Operate mode the transceiver receiving should not suffer. If it worsens and together with this the indicator RX changes into TX although the transceiver is in receive mode, check the control cable connected to the KEY-IN input – S. 2-3(b) for a short circuit. The connection to the transceiver could be wrong too.

d) Test transmission.

Switch to the same band as the transceiver and antenna.

Set the transceiver to a continuous carrier and minimum power. In Operate mode choose a free frequency and push the PTT or CW key briefly, while watching the amplifier's behavior:

- RX mode must have changed to TX;
- the reflected power must read below 20W;
- the forward power must read between 20 and 150W with minimum drive power from the transceiver (between 1 and 5W);

If the above test goes normally, push briefly the PTT once again, this time watching the transceiver's SWR reading (i.e. the input SWR of the amplifier) – this must be below 1.2:1.

e) Setting of drive level and typical operation.

After the successful passing of the above tests push PTT or CW key for several seconds, watching the forward and reflected power. Increase the drive power until the forward power at the amplifier's output reaches 700W.

Upon reaching 700W forward power check the following parameters (continuous carrier operation):

- the reflected power must not exceed ~78W (for SWR 2:1) or better still to be below 28W (for SWR 1.5:1);

- PA DC CURRENT must be between 25 and 30A; it is normal that the current varies within these limits when changing operating frequency and antenna impedance;
- PA DC VOLTAGE must be within 48 – 52V;

- the transceiver's SWR reading must be below 1.2:1.

Enter the MEASURE menu and check:

- the drive power from the transceiver must be between 23 and 40W;

- PA BIAS, which must be between 1.8 and 2.0V (typically 1.9V);

- PA TEMPERATURE, which must be between the ambient and 80ºC (176ºF), depending on the power level and the duration of transmission.

f) Elimination of electromagnetic compatibility (EMC) problems.

If you use an amplifier for the first time in your shack, you may need to make some improvements in the setup. It is possible you might experience tingling from metallic objects due to the stronger radiated RF field. It could affect the operation of your station or systems outside, if they are too sensitive – typical examples are the microphone, CW keyer, computer keyboard / mouse, as well as TV receivers, Hi-Fi, intercom or telephone setups and others.

For instance, induction of RF currents into the microphone, CW keyer or computer keyboard, may lead to distortion in the peaks or self-oscillation in SSB mode, "sticking" or breaking off the dots or dashes from a Morse keyer, or garbling computer screen images. For the elimination of such problems we recommend that you take the following general measures:

- minimize the radiation from the feed lines by reducing the common mode currents in them, improve the balance of antennas and feedlines;

- in case you use asymmetric antennas (GP and similar) install as many radials as practical (use a well-developed counterpoise system);

- add current chokes on the coaxial feeders;

- place as far away as possible (also by height) the radiating elements of antennas from the premises, where the affected devices are located; in this sense, asymmetrical antennas without a separate feeder (Long Wire, Windom, and similar) may cause more interference because their radiating element begins immediately from the shack (part of it is the feeder itself);

- if the use of asymmetrical directly fed "wire" antennas is inevitable, use mainly half wave or half wave multiple – they have a high input impedance, operate respectively with a small current in the feed point, and in the grounding of the shack; thus you can reduce the strength of the disturbing RF fields more than 10 times (at the same radiated power) compared to the case with quarter-wave and multiple to quarter-wave antennas of this class – you should avoid them because they have a low input impedance and operate with a large RF current in the grounding system and in the power supply network respectively, i.e. they create stronger disturbances (RFI);

- improve the RF grounding system: use the shortest and widest possible metal strips for the connections to ground and between the different gear in the shack; connect one or more counterpoises (sized for the problematic band) to the feeder shield at the point, where it enters the building, and the same point - with the possibly shortest and widest connections - to the grounding system: this is a very efficient measure, in particular if the shack is located on a high floor above ground;

- to reduce the RF impedance of the grounding connections sheet metal stripes instead of flexible braids are preferred;

- thread ferrite beads or snap-in ferrites with medium permeability (800-4000) over the power cord, the feeder and the signal cables leading to the affected devices (TV etc); besides the size, consider the frequency range in which the offered ferrites are effective – normally they are optimized for suppression of interferences on HF (with larger permeability), with medium permeability for HF-VHF or with low permeability - only the VHF range. The latter are ineffective for HF;

- whenever possible use shielded cables and ground their shields at both ends;

- the addition of even quite simple low pass L/C or R/C filters directly to the disturbed inputs or outputs of the devices is very effective, provided it is practically applicable.

Last but not least, bear in mind that the benefit of the above measures is two-fold. Firstly - they reduce the interferences from your transmissions to the ambient environment and secondly - they reduce the background noise floor for your reception. Practically, with no great efforts, implementing the above measures, you can reduce the background noise floor with one or more S-units across the different bands. This will allow you not to miss weaker stations, which will hear you because of your increased transmission power.

4. AMPLIFIER OPERATION

4-1. Change of modes RX/TX and Operate/Stand-by; AUTO OPERATE option

a) In **Stand-by** mode, as well as in the unpowered state, receiving and transmitting with the transceiver is done via RF bypass between RF INPUT and RF OUTPUT of the amplifier. In Standby, the transceiver's RF power is not amplified, the control KEY-IN input does not affect the operation, and the KEY-OUT output (S. 2-3(c)) follows the state of the KEY-IN input unconditionally. The bands cannot be changed neither manually nor by CAT or remotely.

b) In **Operate** mode the receive-transmit (RX/TX) direction is controlled by the KEY-IN input:

- at open KEY-IN (Operate/RX mode), the transceiver receives the signals from the antenna through the same RF by-pass path between RF INPUT and RF OUTPUT as with amplifier turned off or in Stand-by mode;

- at grounded KEY-IN ((Operate/TX mode) the RF drive is amplified and fed to the antenna through the RF OUTPUT connector.

C A U T I O N

In order to provide time for the relays to switch safely from receive to transmit, the transceiver should provide a dead time i.e. must "notify" the amplifier in due time by grounding the control KEY IN input not later than 10ms **before** feeding drive power toward the amplifier RF input. Otherwise, the protection system will read "HOT SWITCHING ATTEMPT" and will trip off.

In Operate mode the KEY OUT output (S. 2-3(c)) follows the state of the KEY-IN input only after all conditions for safe transmission have been found good by the amplifier control unit. The KEY OUT output duly disables transmission, if the amplifier is not ready.

The two modes - **Operate** and **Stand-by** - may alternatively be changed:

- either manually (locally) – by pressing the OPR/STB button – see the basic screen in Fig. 3-2, or automatically – when if the AUTO OPERATE option is activated – see S. 5-4(c).

N O T E

Access to the Operate mode can be locked in the AMP SERVICE menu, the OPERATE ACCESS option (S. 5-2 and Fig. 5-2).

c) **AUTO OPERATE** option can be turned on/off by the operator in the USER PREFERENCES menu – S. 5-4 and Fig. 5-4 - or by a remote control command.

When the AUTO OPERATE option is OFF, the two modes Operate and Stand-by can be changed alternatively by the OPR/STB button or by a remote control command. At a SOFT FAULT protection trip, the amplifier will revert to Stand-by and wait for the operator to return it to Operate by pressing the OPR/STB button.

When AUTO OPERATE is ON (S. 5-4), the amplifier will start up in Operate mode. At a SOFT FAULT protection trip, the amplifier will first revert to Stand-by, but will return automatically to Operate mode in about 4 seconds.
Even at AUTO OPERATE on, the operator can revert to and remain in a Stand-by mode manually by the OPR/STB button or by a remote command. The next OPR/STB button push will switch the amplifier to the Operate mode and restore the normal operation of the AUTO OPERATE option.

4-2. Band change, standard and expanded frequency coverage

When connected to a transceiver with CAT, the amplifier will change frequency bands automatically, following the transceiver's operating frequency changes.

Without CAT connection, the bands can be changed either manually or automatically (by the built-in frequency counter).

The bands are changed manually by the up and down BAND buttons.

For an automatic band change via the built-in frequency counter, make a quite short pre-transmission (100ms is enough) – a CW dit, or a sound on SSB) and release a PTT for a moment before the main transmission.

If the new frequency is out of the amplifier's frequency range (S. 8-1(a)), the transmission request will be denied and the following fault message will appear on the screen:

"FREQUENCY OUT OF RANGE"

The amplifier specifications are guaranteed within the bands listed in S. 8-1(a)). Frquency coverage changes could be negotiated with the manufacturer.